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First record of *Dipsas mikanii* Schlegel, 1837 (Serpentes, Dipsadidae) from Espírito Santo state, Brazil

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Abstract

We present the first record of *Dipsas mikanii* Schlegel, 1837 from the state of Espírito Santo, southeastern Brazil. This species has a broad geographic distribution in eastern Brazil. We collected two specimens, one from Água Doce do Norte, a municipality approximately 90 km northeast from the nearest previously known locality in the state of Minas Gerais, and the second from Colatina, about 60 km east from the nearest record in Minas Gerais. We discuss and correct misidentified records of *D. mikanii* from the states of Rio de Janeiro and Santa Catarina.

Keywords

Atlantic Rainforest, Dipsadinae, geographic distribution.

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Introduction

The Neotropical Goo-eater Snake, *Dipsas mikanii* Schlegel, 1837 (Dipsadidae) has a broad geographic distribution in Brazil, where it occurs in five biomes, including the humid Amazon, Atlantic Forest, and Pantanal biomes, and the drier Cerrado and Caatinga. However, this species does not occur in all Brazilian states having these biomes. *Dipsas mikanii* is known to occur in 13 Brazilian states (Bahia, Ceará, Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, Paraíba, Paraná, Rio de Janeiro, São Paulo, and Tocantins) and the Federal District, as well as in neighboring areas of Argentina and Paraguay (Cacciali 2006; Freitas et al. 2014; Costa and Bérnils 2018; Nogueira et al. 2019). Until now, only six of the 14 *Dipsas* species in Brazil (Arteaga et al. 2018; Costa and Bérnils 2018; Nogueira et al. 2019) have been recorded from Espírito Santo: *Dipsas albifrons* (Sauvage, 1884), *D. alternans* (Fischer, 1885), *D. indica* Laurenti, 1768, *D. neuwiedi* (Ihering, 1911), *D. sazimai* Fernandes, Marques & Argôlo, 2010, and *D. variegata* Duméril, Bibron & Duméril, 1854 (Bérnils et al. 2015; Castro and Silva-Soares 2016; Costa and Bérnils 2018; Nogueira et al. 2019).

Dipsas mikanii is a nocturnal, terrestrial, goo-eater (malacophagous), and oviparous snake. Its diet is composed exclusively of slugs of the families Veronicellidae and Limacidae (Laporta-Ferreira et al. 1986; Pizzatto

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et al. 2008; Agudo-Padrón 2013). This species is abundant in disturbed habitats, including those in urban areas (Albuquerque and Ferrarezzi 2004; Barbo 2008; Sawaya et al. 2008; Marques et al. 2009; Barbo et al. 2011). Despite its abundance in many areas, including the other states of southeastern Brazil, *D. mikanii* has not been previously recorded in Espírito Santo. Here, we present the first records of the species from this state.

Methods

We conducted a number of research expeditions in Espírito Santo between 2017 and 2019, and encountered two specimens of *D. mikanii*. The geographic coordinates of the location of each specimen were obtained using a GPS receiver and are in the WGS84 datum. The geographic distribution map was created using ArcGis v. 10.2.2 (ESRI 2014).

The identification of *D. mikanii* was confirmed by the comparison of the pholidotical data, mandibular dimensions, and color patterns of the specimens with the available species diagnoses (Peters 1960; Peters and Orejas-Miranda 1970; Cunha et al., 1980; Hoge et al. 1980; Laporta-Ferreira et al. 1986; Scrocchi et al. 1993; Souza 2016).

Both specimens were collected and deposited in the zoological collection of the Prof. Mello Leitão Biology Museum, part of the National Institute of the Atlantic Forest (INMA) in Santa Teresa, Espírito Santo, Brazil. Specimen collection was authorized by a national permit issued by SISBIO (no. 52838-5).

Results

New records. BRAZIL • 1 ♀, snout–vent length 490 mm, tail length 96 mm; Espírito Santo/ES-080 state highway, municipality of Água Doce do Norte; 18.6437°S, 040.9250°W; 220 m a.s.l.; 19 Dec. 2017; Thiago Silva-Soares leg.; MBML 4472 • 1 ♀, snout–vent length 390 mm, tail length 84 mm; Espírito Santo, municipality of Colatina; 18.6437°S, 040.9250°W; 220 m a.s.l.; 1 Dec. 2019; Flávia G. Chaves and Thiago M. de Castro leg.; urban area; MBML 4633.

The new records (Fig. 1) represent an extension of the known distribution of *D. mikanii* to the Atlantic Forest of Espírito Santo. The nearest previously known locality for *D. mikanii* is in the municipality of Itueta, state of Minas Gerais, southeastern Brazil, to the west of the localities reported here (Fig. 2).

The first specimen reported here (voucher MBML 4472) was a road-killed adult female (number of subcaudal scales = 47). Coffee plantations and cattle pasture surrounded the site where the specimen was found, and the nearest fragment of Atlantic Forest was approximately 300 m away. The second specimen (MBML 4633) was also a road-killed adult (number of subcaudal scales = 48). It was found in an urban area, with the nearest Atlantic forest fragment approximately 200 m away.

Identification

Dipsas mikanii can be distinguished from its congeners by a well-defined set of characters: heavily checkered black-and-white venter; dorsal color pattern composed of contrasting dark saddle-shaped spots on a pale (sometimes white) background; large bright band traversing the snout region (covering primarily the prefrontal plates); dorsal bands reaching the ventral scales; 39–59 subcaudal scales in the females and 45–58 in the males, and relatively long jaws with teeth absent from the first third of maxilla (Scrocchi et al. 1993; Souza 2016).

Discussion

Prior to the present study, the easternmost recorded locality of *Dipsas mikanii* in southeastern Brazil (MCNR 2471) was in the municipality of Itueta (19.4167°S, 041.10416° W), in Minas Gerais (Nogueira et al. 2019). In addition to confirming the occurrence of this species in Espírito Santo, our new records extend this species' known distribution in the Atlantic Forest of southeastern Brazil by approximately 90 km to the northeast of Itueta

Figure 1. Road-killed adult female *Dipsas mikanii* from Espírito Santo state, Brazil. A. Água Doce do Norte (MBML 4472). B. Colatina (MBML 4633).

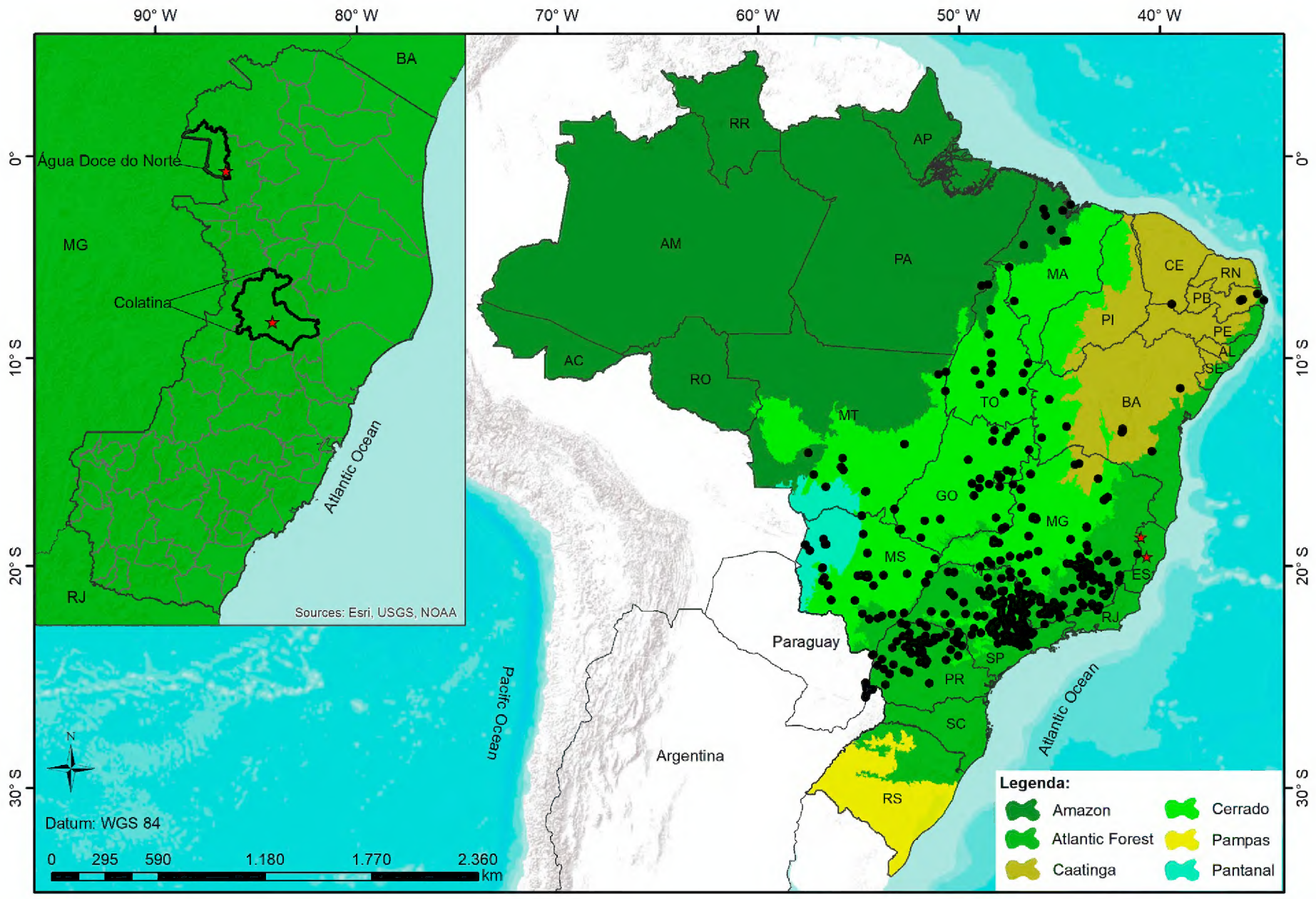

Figure 2. Geographic distribution of *Dipsas mikanii* in Brazil, Argentina and Paraguay with biomes in Brazil in the background. Black dots = previous records; red stars = new records in Espírito Santo state.

(MBML 4472) and circa 60 km east (MBML 4633).

In addition to our new records of *D. mikanii*, we consider erroneous two recently published records of *D. mikanii* from localities farther to the south. The first record, by Agudo-Padrón and Luz (2015), was from the municipality of Florianópolis, on the mainland of the Santa Catarina state. Agudo-Padrón and Luz (2015) included photographs of the specimen, which allowed Entiauspe-Neto et al. (2017) to correct the identification as a juvenile *Dipsas neuwiedi*. Costa and Bérnils (2018) accepted this re-identification in their list of Brazilian reptiles, which recorded *D. mikanii* as being absent from Santa Catarina. While the subsequent *Atlas of Brazilian Snakes* (Nogueira et al. 2019) included *D. mikanii* in eastern Santa Catarina (following Agudo-Padrón and Luz 2015), one of the authors of the Atlas (R.S. Bérnils pers. comm.) clarified that the database used by Nogueira et al. (2019) was compiled prior to the correction published by Entiauspe-Neto et al. (2017). The second record, published by Costa and Bérnils (2018), included *D. mikanii* in the state of Rio de Janeiro. However, we analyzed the specimens in the collection of the Brazilian National Museum and extensively searched the literature but were unable to find any conclusive evidence of *D. mikanii* in the state of Rio de Janeiro.

Thus, we conclude that reports of *D. mikanii* in the states of Rio de Janeiro and Santa Catarina are based on misidentified specimens, in particular because some museums have specimens of *D. neuwiedi* (sensu Peters 1960; Peters and Orejas-Miranda 1970; Hoge et al. 1980) labelled as *Sibynomorphus mikanii*. *Dipsas neuwiedi* was previously classified as a subspecies of *D. mikanii*, and both taxa were formerly assigned to the genus *Sibynomorphus*, which means that the museum labels require updating. The evidence now available indicates that *D. neuwiedi*, but not *D. mikanii*, occurs in Rio de Janeiro and Santa Catarina states.

Although *D. mikanii* is considered to be widespread in enclaves of humid Atlantic Forest and even in anthropogenic environments (Albuquerque and Ferrarezzi 2004; Sawaya et al. 2008; Marques et al. 2009; Barbo et al. 2011), this species has not been previously observed in Espírito Santo. This may be accounted for by the relative lack of fieldwork, both short-term sampling and long-term monitoring, in particular in northern and western areas of the state (e.g. Castro et al. 2017). Clearly, more systematic surveys of the state's reptile fauna will be important to define geographic ranges more accurately and support the development of effective conservation measures.

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Authors' Contributions

TMC, TSS and FGC collected the specimens, and all the authors (TMC, FGC, RSB and TSS) wrote the text. TMC also analyzed the specimens and produced the map. RSB visited the scientific collections.

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